

CLAIMS

What is claimed is:

1. A method for positioning substrates in a substrate processing apparatus having a substrate alignment device, a first substrate transport apparatus and a second substrate transport apparatus, the method comprising:

calibrating the substrate alignment device with a motion of the first substrate transport apparatus;
and

calibrating a coordinate system of the second substrate transport apparatus with the substrate alignment device.

2. The method of claim 1, wherein calibrating the substrate alignment device with a motion of the first substrate transport apparatus comprises:

picking a substrate with a first offset;

recording a first misalignment of the substrate;

picking the substrate with a second offset;

recording a second misalignment of the substrate;
and

calculating a first calibration factor for the substrate alignment device from the first and second misalignments.

3. The method of claim 2, wherein the first and second offsets are radial offsets.

4. The method of claim 2, further comprising:

retrieving a previously stored calibration factor for the substrate alignment device from a memory location;

storing the first calibration factor in the memory location; and

repeating the method of claim 2 if the ratio of the first calibration factor and the previously stored calibration factor is not less than a certain threshold.

5. The method of claim 4, further comprising utilizing the first calibration factor for calculating misalignment of the substrate.

6. The method of claim 4, wherein the certain threshold is approximately 1%.

7. The method of claim 1, wherein synchronizing the coordinate system of the substrate alignment device and the coordinate system of the second substrate transport apparatus comprises:

placing a substrate with a third offset utilizing the second substrate transport apparatus;

recording a third misalignment of the substrate;

placing the substrate with a fourth offset utilizing the second substrate transport apparatus;

recording a fourth misalignment of the substrate;

utilizing the third and fourth misalignments to adjust the coordinate system of the second substrate transport apparatus.

8. The method of claim 7, wherein the third offset comprises a radial offset.

9. The method of claim 7, wherein the fourth offset comprises a tangential offset.

10. The method of claim 7, wherein the third and fourth misalignments each comprise a linear misalignment and an angular misalignment.

11. The method of claim 1, wherein the substrate processing apparatus has at least two load locks, the method further comprising synchronizing location coordinates of the at least two load locks.

12. The method of claim 11, wherein synchronizing location coordinates of the at least two load locks comprises:

placing a substrate in a first of the at least two load locks;

moving the substrate to a second of the at least two load locks;

recording a fifth misalignment of the substrate in the second load lock; and

calculating new location coordinates for the second load lock.

13. The method of claim 12, wherein calculating new location coordinates for the second load lock comprises:

retrieving previously stored location coordinates for the second load lock from a memory location if the fifth misalignment is more than or equal to a particular threshold;

calculating new location coordinates for the second load lock utilizing the fifth misalignment;

storing the new location coordinates in the memory location; and

repeating the method of claim 12.

14. The method of claim 13, wherein the particular threshold is approximately 1 mil.

15. The method of claim 1, wherein the substrate processing apparatus has at least one processing module, the method further comprising correcting location coordinates of the at least one processing module.

16. The method of claim 15, wherein correcting location coordinates of the at least one processing module comprises:

placing a substrate at a known location in the at least one processing module;

picking the substrate with the second substrate transport apparatus and conveying the substrate to the substrate alignment apparatus;

recording a sixth misalignment of the substrate; and
calculating new location coordinates for the at least one processing module.

17. The method of claim 16, wherein calculating new location coordinates for the at least one processing module comprises:

retrieving previously stored location coordinates for the at least one processing module from a memory location if the sixth misalignment is more than or equal to a particular threshold;

calculating new location coordinates for the at least one processing module utilizing the sixth misalignment;

storing the new location coordinates in the memory location; and

repeating the method of claim 16.

18. The method of claim 17, wherein the particular threshold is approximately 1 mil.

19. The method of claim 1, wherein the substrates being positioned are 200 mm or 300 mm semiconductor wafers.

20. A computer program product comprising:

a computer useable medium having computer readable code embodied therein for causing a computer to position substrates in a substrate processing apparatus, the computer readable code comprising:

computer readable program code for causing a computer to calibrate a substrate alignment device with a motion of a first substrate transport apparatus; and

computer readable program code for causing a computer to calibrate a coordinate system of a second substrate transport apparatus with the substrate alignment device.

21. The computer program product of claim 20, wherein the computer readable code for causing a computer to calibrate the substrate alignment device with a motion of the first substrate transport apparatus further comprises:

computer readable program code for causing a computer to pick a substrate with a first offset;

computer readable program code for causing a computer to record a first misalignment of the substrate;

computer readable program code for causing a computer to pick the substrate with a second offset;

computer readable program code for causing a computer to record a second misalignment of the substrate; and

computer readable program code for causing a computer to calculate a first calibration factor for the substrate alignment device from the first and second linear misalignments.

22. The computer program product of claim 21, further comprising:

computer readable program code for causing a computer to retrieve a previously stored calibration factor for the substrate alignment device from a memory location;

computer readable program code for causing a computer to store the first calibration factor in the memory location; and

computer readable program code for causing a computer to repeat the method of claim 20 if the ratio of the first calibration factor and the previously stored calibration factor is not less than a certain threshold.

23. The computer program product of claim 22, further comprising computer readable program code for causing a computer to utilize the first calibration factor for calculating misalignment of the substrate.

24. The computer program product of claim 20 wherein the computer readable program code for causing a computer to synchronize the coordinate system of the substrate alignment device and the coordinate system of the second substrate transport apparatus comprises:

computer readable program code for causing a computer to place a substrate with a third offset utilizing the second substrate transport apparatus;

computer readable program code for causing a computer to record a third misalignment of the substrate;

computer readable program code for causing a computer to place the substrate with a fourth offset utilizing the second transport apparatus;

computer readable program code for causing a computer to record a fourth misalignment of the substrate; and

computer readable program code for causing a computer to utilize the third and fourth misalignments to adjust the coordinate system of the second substrate transport apparatus.

25. The computer program product of claim 20, further comprising computer readable program code for causing a computer to synchronize location coordinates of at least one load lock of the substrate processing apparatus with the coordinate system of the second substrate transport apparatus.

26. The computer program product of claim 25, wherein the computer readable program code for causing a computer to synchronize location coordinates of the at least one load lock comprises:

computer readable program code for causing a computer to place a substrate in the at least one load lock;

computer readable program code for causing a computer to record a fifth misalignment of the substrate in the at least one load lock; and

computer readable program code for causing a computer to calculate new location coordinates for the at least one load lock.

27. The computer program product of claim 26, wherein the computer readable program code for calculating new location coordinates for the at least one load lock comprises:

computer readable program code for causing a computer to retrieve previously stored location coordinates for the at least one load lock from a memory location if the fifth misalignment is more than or equal to a particular threshold;

computer readable program code for causing a computer to calculate new location coordinates for the at least one load lock;

computer readable program code for causing a computer to store the new location coordinates in the memory location; and

computer readable program code for causing a computer to repeat the elements of claim 26.

28. The computer program product of claim 20, further comprising computer readable program code for causing a computer to correct location coordinates of at least one processing module of the substrate processing apparatus.

29. The computer program product of claim 28, wherein the computer readable program code for causing a computer to correct location coordinates of at least one processing module comprises:

computer readable program code for allowing a user to place a substrate at a known location in the at least one processing module;

computer readable program code for causing a computer to pick the substrate with the second substrate transport apparatus and convey the substrate to the substrate alignment apparatus;

computer readable program code for causing a computer to record a sixth misalignment of the substrate; and

computer readable program code for causing a computer to calculate new location coordinates for the at least one processing module.

30. The computer program product of claim 29, wherein the computer readable program code for causing a computer to calculate new location coordinates for the at least one processing module comprises:

computer readable program code for causing a computer to retrieve previously stored location coordinates for the at least one processing module from a memory location if the sixth misalignment is more than or equal to a particular threshold;

computer readable program code for causing a computer to calculate new location coordinates for the at least one processing module utilizing the sixth misalignment;

computer readable program code for causing a computer to store the new location coordinates in the memory location; and

computer readable program code for causing a computer to repeat the elements of claim 29.

31. The computer program product of claim 20, wherein the substrates being positioned are 200 mm or 300 mm semiconductor wafers.